flexitricity

Unlocking smart grid revenue

Electricity Market Reform

Flexitricity's response to DECC consultation

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1 About Flexitricity

Flexitricity Ltd created and now operates the first, largest and most advanced smart-grid system in the UK, bringing revenue to UK businesses, reducing national carbon dioxide emissions and helping to secure energy supplies.

The company was established in 2004 to develop new ways of addressing the short-term balancing requirements of the national electricity system, while reducing CO_2 emissions and facilitating growth in renewable generation. Flexitricity pioneered open-market aggregated demand-side services for electricity system balancing, and continues to lead this sector both in volume and technical capability.

2 General

Flexitricity is strongly supportive of the objectives of the Department for Energy and Climate Change (DECC) as stated in the Electricity Market Reform (EMR) consultation document. Flexitricity sees itself as responsible for delivery of a significant component of these objectives, through the use of aggregated demand-side response to increase security at lower financial and environmental cost. All of our comments are made from that standpoint: we are experts in aggregation and system balancing, but we do not claim similar expertise in the other areas within the EMR.

It appears that decarbonisation is the key agenda in the EMR, and supply-security measures are considered to follow from that. The position is that the UK will build reserve to the extent that the chosen generation mix needs it. The converse point is that it is easy and cheap to build a secure electricity system if CO_2 emissions need not be constrained. However, fuel security is an essential component of system security in any scenario. The EMR gives little direct consideration to this, although previous OFGEM and DECC studies have considered this in much greater detail.

A key goal in implementation must be to ensure that carbon reductions achieved in changing the "bulk" generation mix are not lost through the procurement of high-carbon margin and reserve. We believe that this can be achieved by the market if the regulatory environment is conducive to it.

We believe that the policy preferences stated in the EMR are broadly positive, but the success of each in achieving its goal is critically dependent on the details of the implementation. Specific comments are made below. We have not addressed all of the consultation questions; our comments are largely confined to areas affecting balancing, reserve and the contribution of flexible demand.

3 Feed-in tariffs

Q4: Preference for FIT with CfD

We do not support the "fixed FIT" model in respect of generation with any ability to flex its output. This includes, to varying extents, combined heat and power (CHP), biomass, hydro, landfill gas, sewage gas, tidal with impoundment, and others. The point is that the fixed FIT reduces or removes the ability of the generator to increase revenue by timing its output to maximum need. This may be by following a price profile, or by governing output in response to direct, short-term system needs.

In fact, the presence of arbitrage or reserve opportunities may encourage investment in increased storage (of heat, biomethane, water, etc) or excess generation capacity. This will make the national electricity system more secure and more efficient. It will happen at low capital cost because the responsiveness is created by making incremental changes to assets which have their own *raison d'être*, instead of requiring the construction of stand-alone peaking generators. At first inspection, it appears that FIT-with-CfD is a model which could achieve this.

Q10: Importance of liquidity

Liquidity is vital to the emergence of genuine arbitrage opportunities which should obtain the best value from the FIT-

with-CfD model. Under present market arrangements, liquidity vanishes at around two days ahead. A CHP generator with heat storage can maximise its own revenue and UK supply security, and minimise national carbon emissions, by making day-ahead and within-day adjustments to its generation profile in response to weather and system need. Forward-contracted reserve options, such as STOR, are presently the only viable way for this to be achieved. While these opportunities are valuable, they certainly do not exploit the full flexible resource available.

Q11: Payment of FIT on availability or output

FITs should be paid on output. Schemes which pay on availability are routinely gamed or defrauded, and should be used only where availability is the major service being provided by the generator (in which case additional protections are required). This is discussed further below. Flexing of generation also requires that payments should be related to output: any schemes with "flat" payment structures will not encourage profiled or responsive operating strategies to emerge.

It is a strength of present renewable energy support schemes (such as the Renewables Obligation) that they pay only for metered energy delivered, as this removes a significant reputational vulnerability. Consumers will not continue to support low-carbon generation if it is found that they have funded megawatts which are not real.

4 Capacity mechanisms

Q20: Introduction of a capacity mechanism

We do not support the introduction of a market-wide capacity mechanism. Subject to the details of the implementation, we believe that a targeted capacity mechanism could be useful, though we do not see it as essential.

Q21: Effect on wholesale prices

The effect on the wholesale market depends on the details of the implementation. STOR is partially driven by economics, and its primary economic effect is to reduce the maximum price paid by National Grid for within-gate electricity. This dampens price peaks. It also permits National Grid to issue fewer "BM Startup" instructions (formerly known as "warming" and "hot standby" instructions), and to take fewer margin actions in the balancing mechanism. These effects reduce unnecessary fuel burn, and thus reduce cash-out prices. A targeted capacity mechanism modelled on STOR is likely to have a similar effect.

Q22: Capacity mechanism choices

We support the Government's preferences here. The assignment of responsibility for balancing and reserve to a separate, unbundled, central agency (the system operator, SO) has been one of the most successful features of the UK electricity industry since privatisation. The closely-related markets for reserve and margin are mature and have worked well in a variety of different market conditions, permitting price discovery through tenders and commercial actions by the SO, at timescales ranging from years ahead to within-gate. Furthermore, volume requirement has been set dynamically by the SO, which does so under commercial constraints, which in turn ensures efficient procurement. Since volume is the quantity of interest, not price, and since volume can be adjusted by the SO in accordance with conditions, it is difficult to see how price-based procurement would be more efficient.

Capacity mechanisms are inherently vulnerable to exploitation. The history of the electricity generation industry is littered with cases of availability being declared, and payments claimed, against assets which are not at the time capable of delivery against the commitment. The only means of policing availability declarations is to compare them to delivery, as happens in National Grid's Short Term Operating Reserve (STOR) scheme.

In the case of STOR, the major service being provided by the assets concerned is availability, in which case availability payments are naturally the major part of the revenue earned by the service providers. An energy-only payment scheme would not be suitable for STOR because STOR utilisation is too volatile to support long-term investment by STOR providers and aggregators in generation or demand-reduction capability. However, National Grid has found it necessary to introduce significant "clawbacks" on availability payments for underperforming providers, and has chosen not to renew contracts where reliability has been poor. More recently, National Grid has tended to procure STOR at

relatively low energy prices. These tend to be more regularly utilised, which ensures that their availability can be verified. Steps have also been taken to increase active audit and verification of sites providing STOR services.

In short, STOR works as a capacity mechanism because it is policed, and it exists as a capacity mechanism because of the nature of the service. We believe that any capacity mechanism should similarly target specific capacity *requirements* (rather than specific sources of capacity), and that it should be verifiable.

A major problem with market-wide capacity payments is inefficiency. It has been clearly proven since NETA that a generator which expects to run base load or two-shifting is able to earn commercial revenue from energy produced, with price set by the wholesale markets. No value is obtained by paying a new-build CCGT for capacity. The recent "mothballing" of certain CCGT projects is the result of excess capacity, and an efficient capacity mechanism should not "buy" those projects back into the market until they are required. Major project developers are clearly able to foresee capacity trends and make commercial decisions; it is not clear why the administrator of a market-wide capacity mechanism would have a less "cyclical" view.

We propose that load-factor test be used to determine whether a generator or other site may qualify for a targeted capacity mechanism. STOR sites operate to load factors between 1% and 5%. We suggest that capacity payments should be available only to providers operating at load factors below 10%. With increasing wind-driven supply volatility, the load factor associated with STOR-like services may drift upwards, in which case the load-factor limit may be revised.

A load-factor limit would eliminate the "slippery slope" risk identified in the EMR. Sites participating in STOR forego the right to participate in bulk energy generation; their capacity is considered to be "sterilised" by National Grid for reserve purposes. This is effectively a load-factor limit, and it prevents generators from contracting to STOR where they see better economics at higher load factors.

Q23: Demand-side response

A capacity mechanism could have one of two effects:

1. Growth in a wide variety of demand-side response (DSR) serving several purposes
2. Rapid development of static gasoil-fired (diesel and OCGT) merchant peaking generating stations

The latter outcome is monoculture. It would create a generation base able to respond economically to one type of reserve requirement, namely, responding within minutes to failures at large power stations, and holding this response for two or three hours while large CCGTs were warmed. This is the classic STOR role, and the procurement mechanism for this type of reserve already exists.

However, wind variability introduces a different set of timescales for reserve and margin. Resources such as CHP generation with thermal storage, short-duration demand reduction, or on-the-day profile adjustment by commercial consumers, are far more suitable for balancing varying renewable sources. It would be a significant regulatory failure if diesel generators and OCGTs were deployed to cover this role.

We believe that there should be a load-factor link to carbon content of the reserve generation in any capacity mechanism. If reserve capacity provides energy at a load factor of 1%, it is quite appropriate for diesel or OCGT to provide this, because the presence of this capacity reduces system inefficiency. Reserve availability reduces SO margin actions, most of which cost carbon emissions (in running thermal stations inefficiently at part load, or in warming cold stations). Therefore, at low load factors, even relatively high-carbon generators reduce national emissions.

On the other hand, at higher load factors, the emissions produced locally start to become significant relative to the reduced carbon cost of margin. *Reductio ad absurdum*, the UK's electricity system could become a wind-diesel hybrid, which would not be a desirable outcome in respect of any of the objectives in the EMR. A relationship between load-factor and local carbon emissions would remove this danger.

In general, while we believe that gasoil-fired peaking generation has a signficant role to play, any capacity scheme must ensure that a wide variety of capacity sources is made available to the market. This will maximise market efficiency, minimise emissions, and increase security through diversity.

Q24: Economic or last-resort dispatch

Economic dispatch is strongly preferable. It has been shown to work in STOR and a variety of similar mechanisms. It is a vital part of verification that resources in receipt of capacity payments be required to deliver reasonably regularly. If they are not, experience shows that they will not be reliable, and capacity payments will not create system security.

Q23: Locational payments

The usefulness of resources can vary by location. It seems reasonable that the body procuring the capacity should be able to vary payments by location. Existing mechanisms (STOR and triads) place around one-quarter to one-third of the total value of capacity on a location-specific element. This balance works reasonably well.

5 Implementation issues

We agree that uncertainty has a very serious effect on investment, and we believe that the Government should work hard to assure market participants of all types that existing arrangements will be supported and gracefully transitioned. Open procurement of all necessary capacity services, without disadvantaging any potential participant or creating arbitrary barriers, will give the best outcome in terms of carbon dioxide emissions, supply security, and cost to the consumer.

6 Document information

Flexitricity consents to the use of this document for the purposes of DECC's Electricity Market Reform consultation of March 2011, but requests that any quotations are attributed.

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